Analog input, analog output

Reads an analog input pin, uses voltage to calculate pressure, pressure is converted to velocity using \( v = k \times \sqrt{P} \), velocity is converted to flow rate, flow rate is integrated over time to determine total volume passed through the spirometer. Total time is recorded by pressing appropriate buttons on the device. Results are printed to an LCD screen.

// include the library code
#include <LiquidCrystal.h>

// initialize library with the numbers of the interface pins
LiquidCrystal lcd(8, 9, 4, 5, 6, 7);

const int analogInPin = A1; // Analog input pin, connected to pressure sensor
const int analogButton = A0; // Button

// Variables to change
float inputVolt = 0; // Voltage read from pressure sensor (in bits, 0 to 1023)
float volt_0 = 2.5; // Initial voltage
float volt = 0; // Voltage (converted from 0-255 to 0-5)
float pressure_psi = 0; // Pressure value calculated from voltage, in psi
float pressure_pa = 0; // Pressure converted to Pa
float massFlow = 0; // Mass flow rate calculated from pressure
float volFlow = 0; // Calculated from mass flow rate
float volume = 0; // Integral of flow rate over time

//Constants
float vs = 5 ; // Voltage powering pressure sensor
float rho = 1.225; // Density of air in kg/m3
float area_1 = 0.000415; // Surface area in m2
float area_2 = 0.0000283; // Surface area in m2
float dt = 0;
int button = 0; // Value of button

void setup() {
    // put your setup code here, to run once:
    // set up the LCD's number of columns and rows
    lcd.begin(16,2);
    lcd.print("Volume =");
}

void loop() {
    // put your main code here, to run repeatedly:
// Check if button is pressed, if so enter program condition

lcd.setCursor(0,1);

button = analogRead(analogButton);

if(button>100 && button<150)
{
    inputVolt = analogRead(analogInPin); // Voltage read in (0 to 1023)
    volt = inputVolt*(vs/1023.0);
    pressure_psi = (15/2)*(volt-2.492669); // Pressure in psi
    pressure_pa = pressure_psi*6894.75729; // Pressure in Pa
    massFlow = 1000*sqrt((abs(pressure_pa)*2*rho)/((1/(pow(area_2,2)))-(1/(pow(area_1,2))))); // Mass flow of air
    volFlow = massFlow/rho; // Volumetric flow of air
    volume = volFlow*dt + volume; // Total volume (essentially integrated over time)
    dt = 0.001;
    delay(1);
}
lcd.print(volume);
}